Facilitated Access and Application of Computational Astrostatistics Algorithms
Annual Report for Grant: NNG08EJ50I
PI: Chris Miller
August 1, 2009 to July 31, 2010 (Year 2 of 3)

CTIO - National Optical Astronomy Observatory
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and now at the
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Project Summary:
The goal of this project is to build a set of well-documented libraries and web-services for computational and statistical algorithms designed for use by astronomers. These algorithms are developed by the International Computational Astro-statistics group (InCA), and include active learning search algorithms, KD-tree codes, fast mixture model algorithms, non-parametric statistics and more.

We recognize the need in the astronomical community for a well-documented library of these tools. This project will provide that library in a variety of scripting languages and via web services.

Summary of Expenditures:
The PI hired a post-doctoral researcher (Dr. Craig Harrison) and continued his collaboration with the Center for Mathematical Modeling at the University of Chile through the efforts of scientific programmer Guillermo Cabrera. In year 2, the team focused on building the software libraries to be delivered for this project. Both C. Harrison and G. Cabrera worked full-time on this project during the reporting period. C. Harrison is paid entirely out of the funds appropriated to this project, while G. Cabrera is funded by the University of Chile. In addition, a small amount of international travel funds were used for a collaborative research trip for C. Harrison from Chile to the University of Michigan in April, 2010. These expenditures are in line with what was originally budgeted.

Summary of Progress and Accomplishments:
The Year 2 effort has been to finalize a few specific InCA group algorithms and to organize them into easily usable libraries. The PI has created an “alpha” version of the InCA library that is currently being tested. This version includes thresholding techniques (FDR), K-D tree building, and a non-paramteric fitting routing for 1-D data. The library is built for IDL and Python and includes specific astronomy examples and tutorials designed for astronomers. This version of the library is undergoing final testing and will be ready for release later this year.

The project is on track to produce a second library in the final year of the funding. This final version will be the official InCA library release and will include additional

algorithms, like the E-M algorithm (for Gaussian, log-normal, and Sersic functions). As with our current version of the library, the focus is on the astronomical application of these algorithms, and with documentation and tutorials specifically built for the astronomical community.

Re-location of the PI:
During the second year of the project, the PI moved institutionsss from the National Optical Astronomy Observatory based at Cerro Tololo Interamerican Observatory (CTIO) to the University of Michigan. The funds for this grant were dedicated to the post-doctoral research and the scientific programmer, based at CTIO in La Serena, Chile. And so the year two funds from NASA for this project continued to pay the salaries of the staff in Chile at CTIO.

The PI has submitted a proposal to NASA to move the final year of funding from the the NSF (which is the agency responsible for all funds which go to NOAO) to the University of Michigan. The PI submitted a proposal which highlighted the effort in the final year of the project and a budget that matches the original third year budget, but with the appropriate rates for the University of Michigan. The post-doctoral researcher will be moving from CTIO to the University of Michigan in August, 2010 and will continue to work on this project (as noted in the revised proposal sent to NASA). G. Cabrera will continue to be funded by the University of Chile in our growing collaboration for LSST-related science by the InCA group and the Astro-informatics Science Collaboration within the LSST organization.

The second year of funds for this project have been almost entirely exhausted as originally planned. The PI has initiated the process to close out the initial award to NOAO (via NSF) and return any unused funds from year 2 to NASA.

The PI has focused on a smooth transition for the postdoctoral researcher from Chile to the US. His relocation, visa, and new appointment have been arranged and the final transition process should go smoothly. This is important for the continued progress on this project.

Talks and Publications:

“Deblending Galaxies in Astronomical Images Using Sersic Profiles” Cabrera, G., Miller, C., J., Harrison, 2009, White paper review

“Automated Detection and Deblending of Objects Based on Sérsic Profiles”, Cabrera, G., Miller, C., J., Harrison, C. 2010, AAS Meeting #216, #415.02

“**A New Test of the Statistical Nature of the Brightest Cluster Galaxies**” Lin, Y-T., Ostriker, J.P., and Miller, C.J. 2010, AoJ, 715, 1486

“**Statistical determination of bulk flow motions**” Song, Y-S., Sabiu, C., Nichol. R.C., Miller, C.J. 2010, JCAP, 1, 25